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UTILIZATION OF BARLEY HUSK ASH IN CLAY BRICKS IN ASPECT OF INDIAN CONTEXT: A LITERATURE REVIEW

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ABSTRACT

Brick is one of the most common masonry units as a building material due to its attributes. Clay habitually used in construction. Clay which is a resource material, if not manage well, may pose environmental challenges. Clays used for brick making vary broadly in their composition and are dependent on the locality from which the soul originates. At the same time world-wide agricultural footprint is fast growing, with vast agricultural land cultivation and active expansion of the agro based industries. Agriculture is the most economic activity of India and other developing nations. The resulting large quantities of agricultural wastes, unfortunately, are not always well managed or utilized. These wastes can be reused, such as by retrieving ashes from disposing leaves and hull/ husks, and then incorporate in brick making. In this study, Barley husk ash has been used for the preparation of bricks in partial and total replacement of clay. It is green and environmentally friendly material. For achievement of real sustainable development.

KEYWORDS: Earth Construction, Standardbrick, Barley Husk Ash, Sustainable Development

INTRODUCTION

Shelter is a basic human need and owning a house becomes a lifelong struggle as majority of Indians find housing costs prohibitively expensive. This problem becomes even more acute when considering the low income families who accounts for about 60-70% of Indian population. This reveals the need to bring down the cost of the housing and make it affordable for the booming population. Burnt clay bricks are being used extensively and the most important building material in the construction industry. In India the building industry consumes about millions bricks and some percent of total natural energy consumption in their output. In this contest search for an alternative building material for clay bricks, several federal agencies and research institutions have repeatedly urged the use of waste products such as fly ash, Rise husk ash (RHA), Barley Husk Ash (BHA), groundnut shell, Blast Furnace Slag (GGBS), etc.

MATERIAL

Barley husk ash is obtained by the burning barley husk. Physical properties of the BHA are greatly affected by burning conditions. When the combustion is incomplete, large amount of unburnt carbon is found in the ash. When combustion is completed, grey to whitish ash is obtained. The amorphous content depends on burning temperature and retention time. Optimum properties can be obtained when barley husks are burnt in 500 - 700° C and held for a short time, this temperature at which the husk is being burnt is less than that required for formation of clinkers in the cement manufacturing process, the resulting ash can be used as a replacement of cement in concrete.

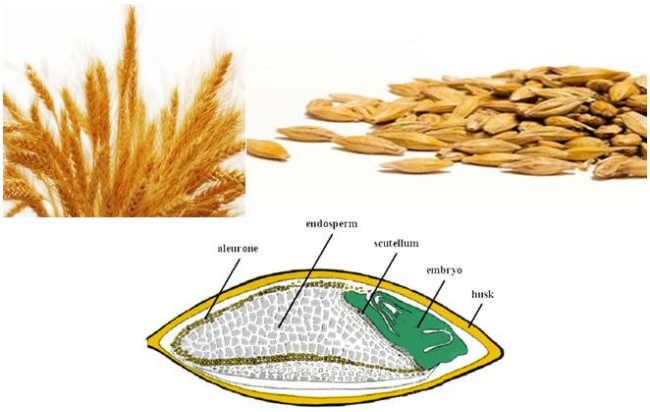


Figure 1: Barley Husk

CHEMICAL COMPOSITION

The chemical composition of BHA produced by utilizing the fluidized bed type furnace is reported to be SiO_2 (80- 95%), K_2O (1-2%) and un -burnt carbon (3-18%). The pozzolanic activity of barley husk ash is effective in improving the strength.

Table 1: Chemical Properties of Barley Husk

Chemical Properties of Barley Husk	SiO_2	K_2O	Unburnt-Carbon
Percentage by mass	**80-95%**	**1-2%**	**3-18%**

Source: http//FAO.org

PHYSICAL COMPOSITION

Physical properties up to material based which used in experimental tasks.

Table 2: Physical Properties of BHA (Barley Husk Ash)

Physical Properties	Percentage by Mass
Moisture content	0.42%
Specific Gravity	1.83

Source: http//FAO.org

CRITICAL LITREATURE REVIEW

Sanjay Salla, Jayesh Pitroda (2013) experimented partial replacement of fly ash by Agro waste. Outcomes that improving in compressive strength and diminution water absorption ratio rather than fly ash brick. Their aim to halt dreadful conditions of fertile soil.

Alaa. A. Shakir, Naganathan, Kamal Nasharuddin Bin Mustapha (2013) In terms of making more environmental and an economical brick neither consume energy resources nor emits pollutant gases gives an economical option to design the green building.

N.Vamsi Mohan, Prof. P. V. V. Satyanarayana,Dr.K.SrinivasaRao (2012) Performance Of Rice Husk Ash Bricks conclude that By the addition of RHA upto 40% to clay, the strength gradually decreased and beyond the addition of 40% RHA the compressive strengths decreased rapidly. Optimum proportion for (RHA + Clay) bricks was observed as 30% RHA and 70% Clay (Maximum of 30% RHA) as the bricks exhibited high compressive strength and low brick weight. As the percentage of RHA increased, water absorption of RHA-Clay bricks also increased. Full replacement of clay with 40% RHA, 40% Lime and 20% gypsum and 50% RHA, 30% lime and 20% gypsum give more strength (41 kg/ cm2) when

compared to all other possible proportions after 28 days curing period. 50% RHA, 30% lime and 20% gypsum are optimum proportion due to its light weight at that proportion. As the percentage of lime and gypsum increased, water absorption of RHA+ Lime+ Gypsum bricks decreased.

P. S. Shehrawat, Nitu Sindhu (2012) Employment opportunities will increase if industries like processing units for producing value added product development of waste collection centers in villages and others have sprung up in the villages.

Jayasankar. R, Mahindran. N, Ilangovan. R (2010) Studies on Concrete using Fly Ash, Rice Husk Ash and Egg shell Powder work it can be concluded that RHA, Fly ash and ESP mixed cubes when added to the grades above M25 may result in the diminution of the strength level. Hence a research study has been proposed to investigate the strength of grades M40, M50 and above grades using RHA, Fly ash and ESP to minimize the use of cement in concrete and also identify the properties of above mentioned.

Subir Shri Singh (2007) Use of environment-friendly technologies, Minimize transportation of material, Maximize the use of local material and resources, Utilization of industrial and mining wastes for the production of building material.

Daniel G. Pennington, Robert C. Frazee, Steven R. Jones, Dan Eaton, David A. Roberti (1999) These products and uses appear to have bright futures and further research will undoubtedly develop productive habits for these wastes.

Mr. Mohammed Majzoub (1999) Modifies properties of those clays and results in better brick qualities compared to other organic waste, improves plasticity, reduces green breakage and acts as an internal fuel in firing bricks thus reducing firing cracks.

PRODUCTION / UTILIZATION OF BARLEY HUSK ASH

Indian Scenario

Barley is cultivated as a rabi crop in India, with sowing being undertaken from October to December and harvesting from March to May.

As per data of agriculturalproductionindia.com India's annual production of Barley has been steadily around 1620-1700 (unit measures-1000 Mt) in the recent years, with production in 2012-2013 estimated to be around 1.69 million tonnes. The area under cultivation has also stabilized at around 0.8-0.9 lakh hectares, with a per hectare output of about 2044 kg.

In addition, to direct human consumption barley is utilized by the beer industry, food processing industry and feed manufacturing industry in India. Annual demand from beer and feed industry is estimated to be around 60,000 tonnes and 25,000 tonnes respectively.

However, growing demand for beer among India's urban young consumers is leading to increased demand for barley malt from Indian beer manufacturing units.The country's beer consumption in volume terms is projected to rise by almost 61% percent between 2009 and 2013. During 2007-12, it is estimated to have risen by about 53% to over 907 million liters.

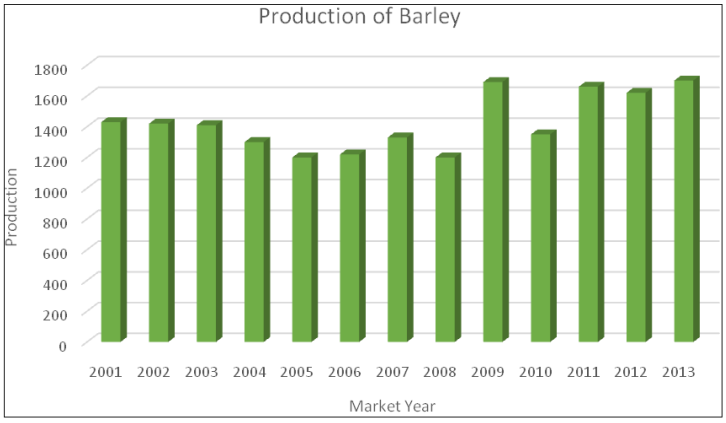
India's barley production is projected to increase to approximately 2 million tonnes in a couple of years to meet the growing demand for barley malt.

[All relevant data of Indian Scenerio taken from : http //agriculturalproductionindia.com]

Table 3: Production of Barley Husk(Unit of Measure:1000 Mt) in Indian Context

Market Year	Production	Growth Rate
2001	1430	-1.38
2002	1420	-0.70
2003	1410	-0.70
2004	1300	-7.80
2005	1200	-7.69
2006	1220	1.67
2007	1330	9.02
2008	1200	-9.77
2009	1690	40.83
2010	1350	-20.12
2011	1660	22.96
2012	1620	-2.41
2013	1700	4.94

Source: www.agricultreindiaproduction.com



Graph 1: Production of Barley vs. Market Year

USES OF BARLEY HUSK ASH

- A step to utilize for Green Construction. Also nonconventional Source optimize at hand.
- BHA bricks can be of good quality with sharp edges, controlled dimensions and offer a plain and even finish.
- BHA bricks can be made in different sizes or shapes, so these can be used in building construction.
- Bulk utilization of BHA helps in solving the pollution problem.
- BHA proved to be quite economical when produced in the vicinity if thermal power plants.
- These bricks are very easy to produce as they manufacturing, process is simple and machinery required is easily available.

CASE STUDY

In every year 60 billion clay bricks are made from burnt clay brick industries, also they create air pollution.Ecosystem damaged very hardly. Appoarch to utilize agricultural wastes and conume fertile land by burnt clay brick industries. In the past one decade or so the joint effortsby R & D organizations, private industries and funding agencies provided the much needed thrust for the actual transfer of technical know-how and product to the end users. Most of the developing countries are very rich in agricultural Activities.

Except a few exceptions, a large part of agricultural waste is being used as a fuel. As per Salla and Pitroda India

alone produces more than 400 million tonnes of agricultural waste annually. It has got a very large percentage of the total world production of rice husk, barley husk, Groundnut shell husk, jute husk, stalk husk, tobaaco husk and coconut husk and various types of fibers are there. All these natural husks have excellent physical and mechanical properties and can be utilized more effectively in the development of building materials (Inclusion in fly ash bricks or clay bricks) for various construction applications.

Sanjay Salla, Jayesh Pitroda (2013) experimented partial replacement of fly ash by Agro waste. Aftermaths that improving in compressive strength and diminution water absorption ratio rather than fly ash brick. Their aim to halt dreadful conditions of fertile soil. Also worked on Comparision of cost-effective ratio with standerd bricks.

Table 4: Economic Feasability (Cost of Materials)

Sr. No	Materials	Rate (Rs/Kg.)
1	Clay	0.58
2	Sand	0.55
3	Barley Husk Ash	0.20
4	Lime- Cao	0.25
5	Kheda dust	1.50

Table 5: Total Cost of Materials for Barley Husk Ash Brick

Types of Brick	Clay	Sand	Kheda Dust	Lime	Barley Huskash	Cost of Barley Husk Brick	Cost of Standard Brick	Cost of Banana Fiber Brick
B0	50	15.00	15.00	10.00	0	3.15	3.15	3.15
B1	40	15.00	15.00	10.00	10	3.10	3.15	3.10
B2	30	15.00	15.00	10.00	20	2.92	3.15	2.94
B3	20	15.00	15.00	10.00	30	2.87	3.15	2.88
B4	10	15.00	15.00	10.00	40	2.78	3.15	2.81
B5	0	15.00	15.00	10.00	50	**2.71**	3.15	2.76

CONCLUSIONS

Study exploration to optimize land erosion by clay brick industry, An approach for environmentally sustainable and create ways for greener the construction. Study justifies that barley husk ash bricks are relatively cheaper and economically feasible for market. Construction activity covers lots of fertile soil and polluted environment day by day. Due some reasons behind in it, it welcomes recession, inflation and encourage illness for the environment.

One step to utilize for Green Construction. Also non-conventional Source optimize at hand to make world anti-polluted and sustainable. Also find alternatives of convectional sources for living healthy and happily.

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